

**CLAIMS:**

1. A WDM multiplexer/demultiplexer comprising:

an input/output optical fiber having an end section;

5 a first set of optical fibers having end sections;

a second set of optical fibers having end sections;

a plurality of wavelength-dependent filters, each wavelength-dependent filter associated and in fixed relationship with an end section of first and second set optical fibers so that light transmitted through said wavelength-dependent filter passes into said associated end section; and

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a core frame holding said end sections of said input/output optical fiber, said end sections of said first and second set optical fibers, and said plurality of wavelength-dependent filters so that light from said input/output optical fiber and reflected by said plurality of wavelength-dependent filters travels in a light path from said input/output optical fiber to each wavelength-dependent filter of each end section of said first and second set optical fibers alternately.

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2. The WDM multiplexer/demultiplexer of claim 1 wherein said core frame has a central space, said end sections of said first set optical fibers aligned in parallel with each other, said end sections of said second set optical fibers aligned in parallel with each other, said end sections of said first set optical fibers and wavelength-dependent filters associated therewith facing said end sections of said second set optical fibers and wavelength-dependent filters associated therewith at an angle across said central space on

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opposite sides of said core frame so that light from said input/output optical fiber and reflected by said plurality of wavelength-dependent filters travels in a light path from said input/output optical fiber to each wavelength-dependent filter of each end section of said  
5 first and second set optical fibers alternately through said central space.

3. The WDM multiplexer/demultiplexer of claim 2 wherein said end sections of said input/output optical fiber and of said first set and second set optical fibers, and said plurality of wavelength-dependent filters are aligned in a plane.

4. The WDM multiplexer/demultiplexer of claim 3 wherein said plurality of  
10 wavelength-dependent filters are mounted on said core frame in first and second linear arrays, said first array associated with said first set optical fibers, and said second array associated with said second set of optical fibers, said first linear array parallel to said second linear array.

5. The WDM multiplexer/demultiplexer of claim 1 further comprising a  
15 package assembly enclosing said end sections of said input/output optical fiber, and said first and second set optical fibers, said plurality of wavelength-dependent filters, and said core frame in a seal.

6. The WDM multiplexer/demultiplexer of claim 5 wherein said package assembly has a length and said end sections of said input/output optical fiber and of said  
20 first set optical fibers are parallel with said package assembly length.

7. The WDM multiplexer/demultiplexer of claim 5 wherein said package assembly comprises a package assembly base and a package top, said package assembly base and top when joined defining a cavity for holding said end sections of said input/output optical fiber, and said first and second set optical fibers, said plurality of wavelength-dependent filters and said core frame, and a moisture seal around a periphery of said package assembly base and top package around said cavity.

8. The WDM multiplexer/demultiplexer of claim 5 further comprising:  
a core assembly including said core frame, said end sections of said input/output optical fiber and said first and second set optical fibers, and said plurality of wavelength-dependent filters, said core assembly providing another moisture seal for said end sections of said input/output optical fiber and said first and second set optical fibers, and said plurality of wavelength-dependent filters.

9. The WDM multiplexer/demultiplexer of claim 1 wherein said plurality of wavelength dependent filters each comprise a die mounted to said core frame so as to allow said die to flex with changes of temperature.

10. The WDM multiplexer/demultiplexer of claim 9 wherein said die has corners and said die mounted to said core frame at said corners.

11. The WDM multiplexer/demultiplexer of claim 10 wherein said die comprises a first side and a second side different from said first side, and wavelength-

dependent filter dice fixed to said core frame by said first side and said second side alternately in said light path to minimize divergence degradation.

12. The WDM multiplexer/demultiplexer of claim 11 wherein said plurality of  
5 wavelength-dependent filters are mounted on said core frame in first and second linear arrays, said first array associated with said first set optical fibers, and said second array associated with said second set of optical fibers, said first linear array parallel to said second linear array, and said first array die mounted to said core frame by said first side and said second array mounted to said core frame by said second side.

10 13. The WDM multiplexer/demultiplexer of claim 11 wherein said die comprises a substrate side and a dielectric-coated side.

14. The WDM multiplexer/demultiplexer of claim 1 wherein said core frame comprises a unitary piece of metal having a base with two parallel channels defining two edge lands, and a central land therebetween with said central space therein.

15 15. The WDM multiplexer/demultiplexer of claim 14 wherein said core frame comprises 440C stainless steel.

16. The WDM multiplexer/demultiplexer of claim 1 wherein each wavelength-dependent filter is selected to transmit different wavelength of light into said associated optical fiber.

17. A WDM multiplexer/demultiplexer comprising:

an input/output optical fiber having an end section;

a plurality of optical fibers having end sections;

5 a plurality of wavelength-dependent filters, each wavelength-dependent filter associated and in fixed relationship with an end section of said optical fibers so that light transmitted through said wavelength-dependent filter passes into said associated end section and said optical fiber; and

a core frame holding said end sections of said input/output optical fiber and said  
10 optical fibers, and said plurality of wavelength-dependent filters so that light from said input/output optical fiber reflected by said plurality of wavelength-dependent filters travels in a light path from said input/output optical fiber to each wavelength-dependent filter of each end section of each optical fiber.

18. The WDM multiplexer/demultiplexer of claim 17 wherein each of said  
15 wavelength-dependent filters has a first side and a second side, wavelength-dependent filters mounted to said core frame by said first side and said second side alternately in said light path to minimize divergence degradation.

19. The WDM multiplexer/demultiplexer of claim 18 wherein said plurality of  
wavelength dependent filters each comprise a die mounted to said core frame so as to  
20 allow said die to flex.

20. The WDM multiplexer/demultiplexer of claim 19 wherein said die has corners and said die mounted to said core frame at said corners.

21. The WDM multiplexer/demultiplexer of claim 20 wherein said die  
5 comprises a substrate side and a dielectric-coated side.

22. A WDM multiplexer/demultiplexer comprising:

- a first optical fiber having an end section;
- a plurality of second optical fibers having end sections;
- a plurality of wavelength-dependent filters, each wavelength-dependent filter  
10 associated and in fixed relationship with an end section of said second optical fibers so that light transmitted through said wavelength-dependent filter passes into said associated end section and said second optical fiber;
- a core assembly including a core frame holding said end sections of said first optical fiber and said second optical fibers, and said plurality of wavelength-dependent  
15 filters so that light from said first optical fiber reflected by said plurality of wavelength-dependent filters travels in a light path from said first optical fiber to each wavelength-dependent filter of each end section of each second optical fiber, said core assembly providing a first moisture seal for said end sections of said first optical fiber and second optical fibers, and said plurality of wavelength-dependent filters; and

a package assembly holding a core assembly therewithin with egress for said first and second optical fibers therefrom, said package assembly providing a second moisture seal for said core assembly.

5           23.     The WDM multiplexer/demultiplexer of claim 22 wherein core frame comprises a unitary piece of metal having a plurality of lands for mounting said end sections of said first and second optical fibers and said wavelength-dependent filters thereon;

            and wherein said core assembly further including comprises a plurality of plates  
10   attached to a top and sides of said core frame for sealing said end sections of said first and second optical fibers and said wavelength-dependent filters within said core frame.

            24.     The WDM multiplexer/demultiplexer of claim 23 wherein said package assembly comprises a base and a complementary top having a cavity therein for receiving said core assembly.

15           25.     The WDM multiplexer/demultiplexer of claim 24 wherein said base and complementary top have a rim around said cavity, said rim having conduits for said first and second optical fibers.

            26.     A method of manufacturing a WDM multiplexer/demultiplexer having an input/output optical fiber and plurality of optical fibers, said method comprising  
20           mounting a plurality of wavelength-dependent filters to a core frame, each of said wavelength-dependent filters having a first side and a second side, said wavelength-

dependent filters mounted to said core frame by said first side and said second side alternately in said light path to minimize divergence degradation; and

mounting end sections of said input/output optical fiber and said optical fibers to  
5 said core frame, each end section of said optical fibers in fixed relationship with one of  
said wavelength-dependent filters so that light transmitted through said wavelength-  
dependent filter passes into said associated end section and said optical fiber and light  
from said input/output optical fiber reflected by said plurality of wavelength-dependent  
filters travels in a light path from said input/output optical fiber to each wavelength-  
10 dependent filter of each end section of each optical fiber.

27. The method of claim 26 wherein said plurality of wavelength dependent filters each comprise a die having corners, and said wavelength-dependent filter mounting step comprises attaching each die by its corners to said core frame so as to allow said die to flex.

15 28. The method of claim 27 wherein said wavelength-dependent filter mounting step comprises applying epoxy between the corners of each die and said core frame and curing said epoxy by UV light.

29. The method of claim 28 wherein said wavelength-dependent filter mounting step further comprises thermally curing said epoxy.

20 30. The method of claim 26 wherein said end sections mounting step comprises:



fixing an end section of said input/output fiber with respect to said mounted wavelength-dependent filters;

then sequentially adjusting each end section of said optical fibers until a  
5 maximum signal is received by the corresponding optical fiber from said input optical fiber 12, and fixing said end section by epoxy to said core frame.

31. The method of claim 26 further comprising:

defining said core frame as a unitary piece of metal.

32. The method of claim 26 further comprising:

10 sealing said end sections, wavelength-dependent filters in said core frame;

providing a package assembly for said sealed core, said package assembly providing egress for said input optical fiber and said optical fibers; and

sealing said sealed core frame within said package assembly to provide a two-stage seal for long-term reliable operation of said WDM multiplexer/demultiplexer.